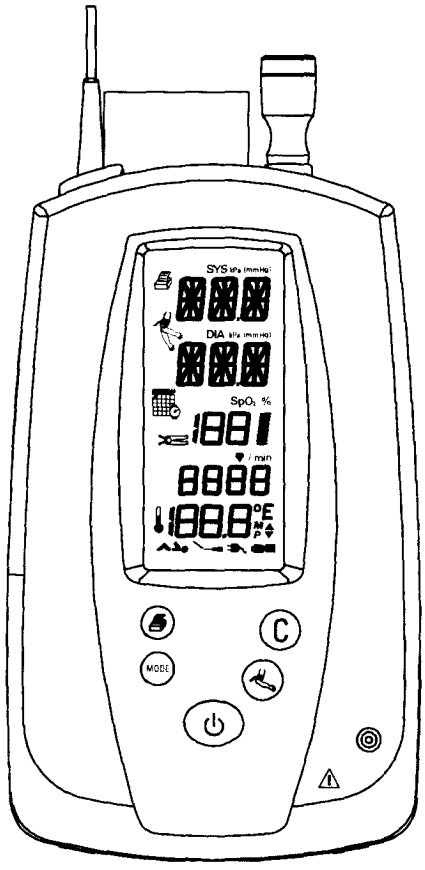
Welch Allyn®

Spot Vital Signs
420 Series



Operator's Manual

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About the Operator's Manual

This Operator's Manual is designed to help you understand the capabilities and operation of your Welch Allyn Spot Vital Signs. The information in this manual includes all options available with the Spot Vital Signs (e.g., SpO_2, temperature, mobile stand, and wall mount). The applicability of some sections of this Operator's Manual depends on the configuration of your particular unit.

This manual is a comprehensive guide to the operation of the Spot Vital Signs. To achieve satisfactory results, you should read this manual thoroughly before attempting to use the device. A Quick Reference Card is provided with certain models of the device as a convenient reference for experienced operators.

Product Overview

The Welch Allyn Spot Vital Signs non-invasively and automatically measures systolic and diastolic pressure, pulse rate, and oxygen saturation (SpO_2) for adult and pediatric patients. Further, the Welch Allyn Spot Vital Signs measures temperature invasively in natural body orifices (i.e., mouth and rectum).

THE WELCH ALLYN SPOT VITAL SIGNS IS NOT INTENDED FOR USE ON NEONATAL PATIENTS.

All blood pressure, pulse, temperature, and SpO_2 values are viewed on a large, easy-to-read display and can be printed via the IR port to an external device as desired.

The rechargeable lead acid battery and variety of mounting accessories make the Welch Allyn Spot Vital Signs convenient for many locations. You may choose any combination of simultaneous measurement modalities.

The Welch Allyn Spot Vital Signs can be used in a wide variety of health care settings. This includes hospital departments as well as alternate care settings such as physicians' offices, clinics, and long-term care facilities. The Welch Allyn Spot Vital Signs is not intended for continuous monitoring of patients, nor for use during the transport of a patient. The Welch Allyn Spot Vital Signs is not intended for use in environments that are not supervised by a health care practitioner.

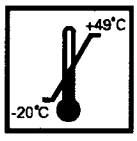
Symbols and Descriptions

Familiarize all operating personnel with the general safety information in this summary. Operators will also find specific warnings and cautions throughout the Operator's Manual. Such specific warnings and cautions may not appear here in this summary.

Caution: Consult Operator's Manual for additional information.

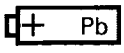
Type BF Equipment

Handle with Care



Transport Temperature

Storage Humidity



Internally Powered, Lead Acid Battery. For disposal see page 52.

Class II Equipment

IPXØ Not protected against the ingress of water.

Mode of Operation: Continuous

Do not dispose of this product as unsorted municipal waste. Prepare this product for reuse or separate collection as specified by Directive 2002/96/EC of the European Parliament and the Council of the European Union on Waste Electronic and Electrical Equipment (WEEE). If this product is contaminated, this directive does not apply.

For more specific disposal information, see www.welchallyn.com/weee, or contact Welch Allyn Customer Service at +44 207 365 6780.

Safety Warnings and Cautions

All operating personnel should be familiarized with the general safety information in this summary. Specific warnings and cautions are also found throughout this Operator's Manual. Such specific warnings and cautions may not appear here in this summary.

General Warnings

⚠ **THE WELCH ALLYN SPOT VITAL SIGNS IS NOT INTENDED TO BE USED ON NEONATAL PATIENTS**. Welch Allyn defines neonates as children 28 days or less of age if born at term (37 weeks gestation or more); otherwise up to 44 gestational weeks. This definition comes from the AAMI SP10-1992 standard.

⚠ To ensure pediatric blood pressure accuracy and safety, the Welch Allyn Child Print Cuff (5200-03), the Welch Allyn Small Child Durable One-Piece Cuff (5082-203-3), and the Welch Allyn Small Child Disposable One-Piece Cuff (5082-93-3) are the smallest cuffs allowed for use with young children and infants. The circumference of the child's arm must fit within the range markings on the cuff.

⚠ The Welch Allyn Spot Vital Signs is designed for use by medical clinicians. Although this manual may illustrate medical spot check techniques, only a trained clinician who knows how to take and interpret a patient's vital signs should use this system.

⚠ The information in this Operator's Manual is a comprehensive guide to the operation of the Welch Allyn Spot Vital Signs. To achieve satisfactory results, you should read the manual thoroughly before attempting to use the device.

⚠ The Spot Vital Signs is not intended for continuous monitoring and is therefore not defibrillator proof. **Do not leave the device unattended while taking measurements on a patient.**

⚠ To ensure patient safety, use only accessories and supplies (i.e., cuffs, hoses, temperature probes, SpO_2 sensors, etc.) recommended or supplied by Welch Allyn for the Welch Allyn Spot Vital Signs. See "Supplies And Accessories" on page 53.

⚠ Do not operate the Welch Allyn Spot Vital Signs in the presence of flammable anesthetics or other explosive atmosphere. An explosion may result.

⚠ Avoid compression of the cuff tubing or pressure hose of the Welch Allyn Spot Vital Signs. Compression of the cuff tubing or pressure hose may cause system errors to occur in the device.

⚠ Care should be taken to prevent water or other fluid from entering any connectors on the device. Should this occur, the connectors should be dried with warm air. All operating functions should then be checked for proper operation.

⚠ Any Spot Vital Signs which has been dropped or damaged should be checked by qualified service personnel to ensure proper operation prior to use.

⚠ Every three months, inspect the temperature probe, SpO_2 cord, and accessories for fraying or other damage. Replace as necessary.

There are no user-serviceable parts inside the device other than battery replacement. Refer to unit to the Authorized Service Center listed on page 57.

The Spot Vital Signs should not be used on patients who are linked to heart/lung machines.

The Spot Vital Signs does not operate effectively on patients who are experiencing convulsions or tremors.

This device complies with current required standards for electromagnetic interference and should not present problems to other equipment or be affected by other devices. As a precaution, avoid using this device in close proximity to other equipment.

This device is not intended for hand-held use during operation.

Welch Allyn recommends that the battery is left in the device, regardless if the device is not used for long periods of time, since there is no hazard of leaving the battery in the device.

Connection of accessories not approved by Welch Allyn with the Spot Vital Signs can affect patient and/or operator safety.

Do not autoclave.

Welch Allyn is NOT responsible for the integrity of any wall or IV pole mounting interface. Welch Allyn recommends that the customer contact their Biomedical Engineering department or maintenance service to ensure professional installation, safety, and reliability of any mounting accessory.

Blood Pressure Warnings

- To ensure pediatric blood pressure accuracy and safety, the Welch Allyn Child Print Cuff (5200-03), the Welch Allyn Small Child Durable One-Piece Cuff (5082-203-3), and the Welch Allyn Small Child Disposable One-Piece Cuff (5082-93-3) are the smallest cuffs allowed for use with young children and infants. The circumference of the child's arm must fit within the range markings on the cuff.
- You may experience inaccurate blood pressure measurements if cuffs and/or hoses other than those provided by Welch Allyn for the Spot Vital Signs are used.
- Patients that are experiencing moderate to severe arrhythmias may give inaccurate blood pressure measurements.
- When several blood pressure measurements are taken on the same patient, it is recommended that the cuff site and extremity are checked regularly for possible ischemia, purpura, and/or neuropathy.

SpO_2 Warnings

- The operation of the SpO_2 sensor in MRI environments is specifically not recommended.
- Use only SpO_2 sensors and accessories that are compatible with the SpO_2 configuration purchased. The Welch Allyn Spot Vital Signs with Nellcor® pulse oximetry option may only be used with Nellcor brand sensors and accessories. Other sensors or cables may cause improper performance.
- The SpO_2 sensors and extension cables are intended for use only for pulse oximetry measurements. Do not attempt to connect these cables to a PC or any similar device.
- Before use, carefully read the sensor's directions for use, including all warnings, cautions, and instructions.
- Do not use a damaged sensor or pulse oximetry cable. Do not use a sensor with exposed optical components.
- Tissue damage is caused by incorrect application or duration of use of an SpO2 sensor. Inspect the sensor site periodically as directed in the sensor's direction for use.
- Pulse oximetry readings and pulse signal is affected by certain ambient environmental conditions, sensor application errors, and certain patient conditions.
- Do not immerse or wet the sensor.
- Do not use the pulse oximetry cable or power cord to lift the unit because the cable or cord could disconnect from the unit, causing the unit to drop on the patient.

Temperature Warnings

- Single-use, disposable probe covers, available from Welch Allyn, limit patient cross-contamination. The use of any other probe cover or the failure to use a probe cover may produce temperature errors and is specifically not recommended.
- Use only oral probes (blue) for taking oral and axillary temperatures. Use only rectal probes (red) for taking rectal temperatures. The use of the wrong probe may produce temperature errors.
- Do not allow the tip of the temperature probe to come into contact with any heat source (e.g., hands or fingers) prior to taking a temperature measurement. If this occurs, discard the probe cover and start the temperature determination again.

IR Communications Port Warnings

- The Welch Allyn Spot Vital Signs contains an infrared communications port for isolated communications with external devices. The port is located on the side of the device to preclude direct eye contact on a continual basis when viewing the display. As a precaution, do not look directly into the infrared port during operation.

General Cautions

- If the accuracy of any measurement is in question, check the patient's vital sign(s) by an alternate method, then check to make sure the device is functioning properly.
- Ensure the device is placed on a secure surface or use one of the optional mounting accessories.
- Do not place fluids on the device.

Blood Pressure Cautions

- Extremity and cuff motion should be minimized during blood pressure determinations.
- If the blood pressure cuff is not at heart level, the difference in reading due to the hydrostatic effect should be noted. The value of 1.80 mmHg must be added to the displayed reading for every inch (2.5 cm) above heart level. The value of 1.80 mmHg must be subtracted from the displayed reading for every inch (2.5 cm) below heart level.
- Proper blood pressure cuff size and placement is essential to the accuracy of the blood pressure determination. See "Chart for Determining Cuff Size" on page 31 for cuff sizing information.
- When measuring blood pressure on children younger than 3 years of age, it is recommended that the Pressure Preset (initial inflation pressure) be set at 160 mmHg or lower.

SpO_2 Cautions

- The pulse oximeter is calibrated to determine the percentage of arterial oxygen saturation of functional hemoglobin. Significant levels of dysfunctional hemoglobin such as carboyhemoglobin or methmoglobin may affect the accuracy of the measurement.
- Some intravascular dyes, depending on the concentration, may affect the accuracy of the SpO_2 measurement.
- Some sensors may not be appropriate for a particular patient. If at least 10 seconds of perfusion pulses cannot be observed for a given sensor, change sensor location or sensor type for perfusion to resume.
- The sensor disconnect message indicates that the sensor is either disconnected or the wiring is faulty. The user should check the sensor connection and, if necessary, replace the sensor, pulse oximetry cable, or both.

  NOTE: Physiological conditions, medical procedures, or external agents that may interfere with the pulse oximeter's ability to detect and display measurements include dysfunctional hemoglobin, arterial dyes, low perfusion, dark pigment, and externally applied coloring agents such as nail polish, dye, or pigmented cream.

  When selecting a sensor, consider the patient's weight and activity level, the adequacy of perfusion, the available sensor sites, the need for sterility, and the anticipated duration of monitoring.

Temperature Cautions

- The Welch Allyn Spot Vital Signs is FDA cleared to measure the axillary temperature in Normal Mode for children under the age of 4. Normal Mode axillary temperatures may not be accurate on older children or adults.
  THE WELCH ALLYN SPOT VITAL SIGNS IS NOT INTENDED TO BE USED ON NEONATAL PATIENTS.

⚠ Précautions relatives à la température

- Le Welch Allyn Spot Vital Signs est approuvé par la FDA pour mesurer la température axillaire en mode normal pour les enfants de moins de 4 ans. Les températures axillaires du mode normal peuvent ne pas être précises sur des enfants plus âgés ou des adultes.
  LE WELCH ALLYN SPOT VITAL SIGNS N'EST PAS CONCU POUR UNE UTILISATION SUR DES NOUVEAU-NES.

Indications/Contraindications for Use

The Welch Allyn Spot Vital Signs measures blood pressure, pulse rate, temperature, and oxygen saturation (SpO_2) of adult and pediatric patients. The device is not designed, sold, nor intended for use other than previously stated.

THE WELCH ALLYN SPOT VITAL SIGNS IS NOT INTENDED FOR USE ON NEONATAL PATIENTS.

To ensure pediatric blood pressure accuracy and safety, the Welch Allyn Child Print Cuff (5200-03), the Welch Allyn Small Child Durable One-Piece Cuff (5082-203-3), and the Welch Allyn Small Child Disposable One-Piece Cuff (5082-93-3) are the smallest cuffs allowed for use with young children and infants. The circumference of the child's arm must fit within the range markings on the cuff.

The Welch Allyn Spot Vital Signs is FDA cleared to measure the axillary temperature in normal mode for children under the age of 4.

The Welch Allyn Spot Vital Signs is not intended for continuous monitoring and is therefore not defibrillator proof. **Do not leave the device unattended while taking measurements on a patient.**

The Welch Allyn Spot Vital Signs should not be used on patients who are linked to heart/lung machines.

Special Features

The following special features enhance the use of the Welch Allyn Spot Vital Signs:

Choice of Measurement Modalities

The Welch Allyn Spot Vital Signs takes non-invasive blood pressure, temperature, and SpO_2 measurements independently or simultaneously.

Non-Invasive Oscillometric Blood Pressure

Eliminates the risk associated with invasive monitoring, with no need for microphones or external transducers.

Operator Friendly Results

Large, easy-to-read Liquid Crystal Display (LCD).

AC or Self-Contained Battery Power

The Welch Allyn Spot Vital Signs can be made available in many convenient locations, for a variety of spot-check needs.

Blood Pressure

A single blood pressure determination is made when the Blood Pressure Start/Stop button is pushed.

To cancel a measurement cycle at any time, press the Blood Pressure Start/Stop button again. This action immediately initiates a rapid cuff deflation.

The blood pressure measurement data appears on the display immediately following the measurement and remains displayed for 2 minutes. After 2 minutes, the display goes blank and the device goes into Standby Mode. To recall the most recent blood pressure measurement, press the Print, Mode, Next Patient/Clear/Cancel, or Blood Pressure Start/Stop button.

Maximum and Minimum Blood Pressure Ranges

The maximum and minimum blood pressure ranges are as follows:

Measurement	Maximum	Minimum
Systolic Pressure	250 mmHg	60 mmHg
Diastolic Pressure	160 mmHg	30 mmHg

Mean Arterial Pressure (MAP)

The MAP ranges are 40 to 190 mmHg, calculated from systolic and diastolic data (not measured directly).

Temperature

Thermometry measurements are made with Welch Allyn SureTemp® technology. Oral and rectal probes utilize single-use disposable probe covers that limit cross-contamination. Oral, axillary, or rectal temperatures are taken using Normal or Monitor operating modes. Oral and axillary temperatures are taken using the blue oral probe. Rectal temperatures are taken using the red rectal probe.

In Normal Mode, the thermometer's microprocessor predicts body temperature in approximately 4 seconds for oral temperatures, 10 seconds for axillary temperatures, and 15 seconds for rectal temperatures. When using Monitor Mode, allow the temperature readout to stabilize for 3 minutes for oral and rectal temperatures, and 5 minutes for axillary temperatures. The Monitor Mode continues to display an updated temperature as long as the probe remains in place. Settings for Fahrenheit or Celsius scales are available for the temperature readings display.

Normal Temperature Mode

Normal oral mode is the default operating mode for temperature determinations.

In Normal Mode, the Spot Vital Signs measures temperature at discrete intervals, then calculates the rate of change according to a proven algorithm. This allows the thermometer to predict the end point the thermistor would reach if it were left in the mouth until it reached mouth temperature. This predictive feature allows the thermometer to arrive at an accurate oral temperature reading in approximately 4 seconds.

Operator-selectable patient alarm limits are not available in Normal Mode. However, temperatures that are outside the operating range of the device are noted on the temperature display (see "Temperature Measurement Range Indicators" on page 29 for further details).

Monitor Temperature Mode

Continuous Monitor Mode operation is normally used when difficult situations prevent taking accurate temperatures in the Normal Mode, or in clinical situations in which the clinician is interested in trending the patient's temperature (see "Temperature Measurement Range Indicators" on page 29 for further details). Maintain probe contact with the tissue for at least 3 minutes for accurate oral/rectal temperature measurement, and 5 minutes for accurate axillary temperature measurement. Monitor Mode temperatures may not match identically to predicted "normal" temperatures because of ambient temperature influence and other factors. The trend in temperature is the important standard when in Monitor Mode.

Operator-selectable patient alarm limits are not available in Monitor Mode. However, temperatures that are outside the operating range of the device are noted on the temperature display (see "Temperature Measurement Range Indicators" on page 29 for further details).

SpO_2

The Spot Vital Signs incorporates the Nellcor pulse oximetry system which determines arterial oxyhemoglobin saturation (SpO_2%) by measuring the absorption of red and infrared light passed through the tissues. Changes in absorption caused by pulsation of blood in the vascular bed are used to determine arterial saturation and pulse rate.

Oxygen saturation percent is calculated with each pulse detected, so the display is continually updated. The pulse signal bar graph is an indicator of the strength and quality of the detected pulses.

The Spot Vital Signs determines pulse rate as an adjunct to blood pressure measurement and SpO_2 measurement.

The pulse rate, in beats per minute, is determined primarily from the SpO_2 measurement methodology. In the case where SpO_2 is not available, or is disabled, the pulse rate display is driven from data collected as part of the blood pressure measurement method.

Removal of the SpO_2 sensor from the patient initiates an audible beep, to alert you to the fact that the sensor is no longer attached to the patient.

SpO_2 is generally measured via pulses detected using a finger sensor and performs most accurately with the finger clip sensor. All fingers, except the thumb, can use the finger clip sensor. For certain situations, measurement and alternate site measurements for SpO_2 can include the earlobe, forehead, and toes. These situations require special sensors. The finger clip sensor is recommended for spot checks or short-term evaluation (less than 60 minutes). Patient supervision is required, since the Spot Vital Signs has no alarm capability.

Oxygen saturation and pulse rate are displayed on the LCD screen. On each detected pulse, the pulse signal bar graph flashes. The intensity of this signal is a simple visual indicator of waveform signal strength and can identify possible situations of inadequate pulsatile nature of tissue for an accurate SpO_2 reading. The update interval bar of the bar graph should correspond to the patient's pulse rate. This is an indication of the quality of the SpO_2 signal.

Pulse Rate

The Welch Allyn Spot Vital Signs determines pulse rate as an adjunct to blood pressure measurement and SpO_2 measurement.

The pulse rate, in beats per minute, is determined primarily from the SpO_2 measurement methodology. In the case where SpO_2 is not available or is disabled, the pulse rate display is derived by data from the blood pressure measurement method.

Performance Specifications

Patient Population

The Welch Allyn Spot Vital Signs is designed for use with adult and pediatric patients. Welch Allyn defines a pediatric patient as 29 days old or more.

THE WELCH ALLYN SPOT VITAL SIGNS IS NOT INTENDED FOR USE ON NEONATES.

Welch Allyn defines neonates as children 28 days or less of age, born at term (37 weeks gestation or more), otherwise up to 44 gestational weeks.

Cuff Pressure Range

0 mmHg to 300 mmHg

Initial Cuff Inflation

160 mmHg

Systolic Range

60 mmHg to 250 mmHg

Diastolic Range

30 mmHg to 160 mmHg

Blood Pressure Accuracy

Blood pressure accuracy meets or exceeds SP10-1992 AAMI standards for non-invasive blood pressure accuracy (AAMI standard: ± 5 mmHg mean error, 8 mmHg standard deviation). Blood pressure accuracy is validated for pressure measurement using the upper arm only.

Blood Pressure Determination Time

Typical: 20 to 45 seconds Maximum: 165 seconds

Pulse Rate Range (using SpO_2 determination)

20 bpm to 250 bpm

Pulse Rate Range (using Blood Pressure determination)

40 bpm to 200 bpm

Pulse Rate Accuracy (using SpO2 determination)

Typical: 20 to 250 bpm ± 3 digits*
Low Perfusion: 20 to 250 bpm ± 3 digits*

Pulse Rate Accuracy (using Blood Pressure determination)

±5.0%

* Specification applies to monitor performance and was validated with Biotek and Nellcor simulators.

Overpressure Cutoff

300 mmHg -0/+15 mmHg

Temperature Ranges

Measurement	Maximum	Minimum
Temperature	109.4° F 43.0° C	86.0° F 30.0° C

Temperature Accuracy

Calibration accuracy: ± 0.2° F (± 0.1° C).

Temperature Determination Time

Oral: 4 seconds typical, 15 seconds maximum
Axillary: 10 seconds typical
Rectal: 15 seconds typical

Oxygen Saturation Range (SpO_2%)

40 to 100% oxygen saturation

SpO_2 Accuracy

Typical: 70 to 100% ± 2 digits*
Low Perfusion: 70 to 100% ± 2 digits**
<70% unspecified by the OEM

Biocompatibility testing has been conducted on Nellcor sensors in compliance with ISO10993-1, Biological Evaluation of Medical Devices, Part 1: Evaluation and Testing. The sensors have passed the recommended biocompatibility testing and are therefore in compliance with ISO 10993-1.

* Adult specifications are shown for OxiMax MAX-AI sensors. Saturation accuracy will vary by sensor type. Refer to the following Sensor Accuracy Grid.

**Applicability: OxiMax MAX-AI, MAX-ALI, MAX-PI, and MAX-II sensors.

Sensor Accuracy Guide

Sensor Models	SpO_2 Range 70% - 100%
OXIMAX Sensor Models Single Patient Use	
MAX-AI,* MAX-ALI*	± 2
MAX-PI*	± 2
MAX-II*	± 2
MAX-RI**	± 3.5
OxiCliq Sensor Models Single Patient Use	
OXICLIQ-A	± 2.5
OXICLIQ-P	± 2.5
Reusable Sensor Models	
D-YS (Infant to Adult)	± 3
D-YS & D-YSE	± 3.5
DS-100A	± 3
OXI-A/N (Adult)	± 3
OXI-P/I	± 3

* The accuracy specification under motion conditions is + 3. For a definition of motion, contact Nellcor Technical Services or your local Nellcor representative.

**The accuracy specification has been determined between saturations of 80% - 100%.

Accuracy Specifications: Accuracy specifications are based on controlled hypoxia studies with healthy, non-smoking adult volunteers over the specified saturation SpO2 range. Pulse oximeter SpO2 readings were compared to SaO2 values of drawn blood samples measured by hemoximetry. All accuracies are expressed as ± "X" digits. This variation equals ± one standard deviation (± 1 SD), which encompasses 68% of the population.

Mechanical Specifications

Dimensions

Height:	9.70 inches (24.64 cm)
Length:	5.72 inches (14.53 cm)
Depth:	4.73 inches (12.01 cm)

Weight

Approximately 4.25 pounds (1.91 kg)

Mounting

Self-supporting on rubber feet
Custom Mobile Stand
Custom Wall Mount
Custom IV Pole Mount

Portability

May be hand-carried when held by the rear handle.

Electrical Specifications

Power Requirements

Patient-rated isolation transformer is connected to AC mains:

North American Version:	120VAC, 60Hz. 0.20A Input, 8VDC, 0.75A Output
International Version:	240VAC, 50Hz 0.10A Input, 8VDC, 0.75A Output
Australian Version:	240VAC, 50Hz, 13VA Input, 8VDC, 0.75A Output

Battery

Lead acid, with external charger.

A fully charged battery supports 130 typical blood pressure determinations taken at 7-minute intervals. The battery is 90-100% charged after 12 hours of charging. The battery automatically charges when the Spot Vital Signs is powered through the AC power transformer. The battery charges faster when the instrument is not in operation.

Environmental Specifications

Operating Temperature

+10° to +40° C (Thermometer operating temperature 16° to 40° C)
+50° to +104° F (Thermometer operating temperature 61° to 104° F)

Storage Temperature

-20° to +50° C
-4° to +122° F

Transport Temperature

-20° to +49° C
-4° to +122° F

Relative Humidity

15 to 90% (non-condensing)

Operating Altitude

-170 to +4877 m
-557 to +16,000 ft.

Guidance and Manufacturer's Declaration

Emissions and Immunity Information

Electromagnetic Emissions

The 420 Series Spot Vital Signs is intended for use in the electromagnetic environment specified below. The customer or user of the 420 Series Spot Vital Signs electrocardiograph should assure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment - Guidance
RF emissions CISPR 11	Group 1	The 420 Series Spot Vital Signs uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The 420 Series Spot Vital Signs is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Electromagnetic Immunity

The 420 Series Spot Vital Signs is intended for use in the electromagnetic environment specified below. The customer or user of the 420 Series Spot Vital Signs should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/ burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions, and voltage variations on power supply input lines. IEC 61000-4-11	>95% dip in 0.5 cycle 60% dip in 5 cycles 30% dip for 25 cycles >95% dip in 5 seconds	>95% dip in 0.5 cycle 60% dip in 5 cycles 30% dip for 25 cycles >95% dip in 5 seconds	Mains power quality should be that of a typical commercial or hospital environment. If the user of the 420 Series Spot Vital Signs requires continued operation during power mains interruptions, it is recommended that the 420 Series Spot Vital Signs be powered from an uninterruptible power supply or battery.
Power frequency (50/60Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

Electromagnetic Immunity

The 420 Series Spot Vital Signs is intended for use in the electromagnetic environment specified below. The customer or user of the 420 Series Spot Vital Signs should assure that it is used in such an environment.

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment - Guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the 420 Series Spot Vital Signs including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance**
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	V1 = 3 Vrms	$d = (1.17)\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	E1 = 3 V/m	$d = (1.17)\sqrt{P}$ 80 MHz to 800 MHz $d = (2.33)\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol:

Note 1: At 80 MHz and 800 MHz, the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the 420 Series Spot Vital Signs electrocardiograph is used exceeds the applicable RF compliance level above, the electrocardiograph should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the electrocardiograph.

[b] Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

Recommended Separation Distances Between Portable and Mobile RF Communications Equipment and the 420 Series Spot Vital Signs

The 420 Series Spot Vital Signs is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or user of the 420 Series Spot Vital Signs can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the 420 Series Spot Vital Signs as recommended below, according to the maximum output power of the communications equipment.

	Separation Distance According to Frequency of Transmitter (m)		
Rated Max. Output Power of Transmitter (W)	**150 kHz to 80 MHz** $d = (1.17)\sqrt{P}$	**80 MHz to 800 MHz** $d = (1.17)\sqrt{P}$	**800 MHz to 2.5 GHz** $d = (2.33)\sqrt{P}$
0.01	0.11667	0.11667	0.23333
0.1	0.36894	0.36894	0.73785
1	1.1667	1.1667	2.3333
10	3.6894	3.6894	7.3785
100	11.667	11.667	23.333

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

Note 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

Agency Approvals

ETL LISTED C US 74227

CERTIFIED TO: CAN/CSA STD C22.2 NO. 601.1

CONFORMS TO: IEC 60601, UL STD 2601-1

WELCH ALLYN PTY LTD
5/38-46 SOUTH STREET
RYDALMERE
NSW 2116
AUSTRALIA
N344

EMC Framework of Australia

CE 0050

The CE mark on this product indicates that it has been tested to and conforms with the provisions noted within the 93/42/EEC Medical Device Directive.
Authorized European Representative Address:
European Regulatory Manager
Welch Allyn Ltd.
Navan Business Park
Dublin Road
Navan, County Meath, Republic of Ireland
Tel.: 353-46-67700 • Fax: 353-46-27128

Unpacking Checklist

After you have unpacked the Welch Allyn Spot Vital Signs and applicable accessories, identify each item with the following checklist and inspect for missing items. Retain the shipping materials in the event of shipping damage or for return, if necessary, to Welch Allyn for repair or warranty service.

All Spot Vital Signs include the following components:

Spot Vital Signs
This device is portable, lightweight, and designed to automatically measure and display blood pressure and pulse rate. Options include thermometry and pulse oximetry.

Operator's Manual
To achieve satisfactory results, you should read this manual thoroughly before attempting to use the Spot Vital Signs. Save this manual for helpful product reference.

Instrument Warranty Card
Fill the warranty card out today and return to the Welch Allyn Service Center. This card validates your warranty.

Adult Durable Cuff Assembly
Includes one adult cuff and pneumatic tubing with connector. Other size cuff assemblies are available separately.

Pressure Hose
Includes a latex-free pressure hose with connector. This hose connects a variety of sizes of blood pressure cuffs to the Spot Vital Signs.

Power Transformer and Cord Assembly
Operates the Spot Vital Signs and charges the internal battery.

Certain Spot Vital Signs include the following items, based on the options purchased:

Quick Reference/Error Code Card
The Quick Reference Card (available with certain models) provides a quick operation guide and error codes. The card is attached to the device handle or mobile stand.

Temperature Probe and Covers
The device includes one oral (blue) temperature probe and one box of 25 single use, disposable probe covers for temperature determinations.

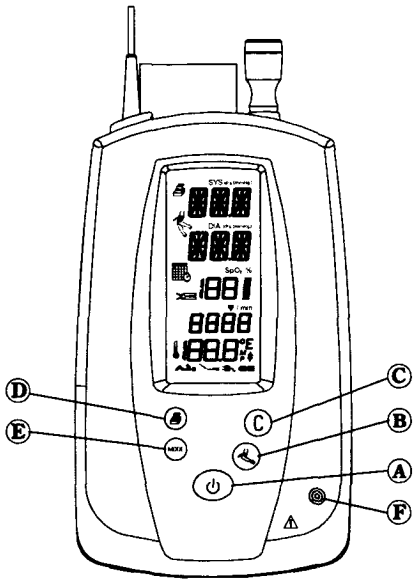
Pulse Oximetry (SpO_2) Sensor and Cable
The SpO_2 finger clip sensor and cable are for use with adult and pediatric patients. Other sensors are available separately (see "Supplies And Accessories" on page 53).

Note: Report any signs of shipping damage to the carrier. If an item is missing or damaged, contact the Welch Allyn Service Center near you.

Controls, Indicators, and Connections

Note: In this section, all drawing and text are representative of the Spot Vital Signs with all available options. Your device may not include all functions, depending on the options purchased.

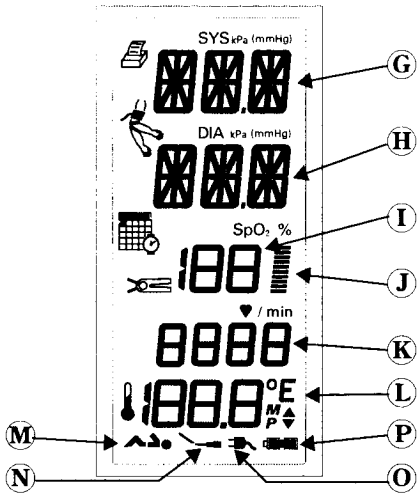
Front Panel Functions



	Description	Function
A	Power Button	This on/off button controls power to the device. Battery power is used unless the device is powered through the AC power transformer.
B	Blood Pressure Start/Stop Button	Pressing this button initiates a new blood pressure cycle. Pressing this button again aborts an active blood pressure measurement and deflates the cuff.
C	Next Patient/Clear/ Cancel Button	• Pressing this button while the display is active clears the display. • Pressing this button while the device is in Standby Mode recalls the last patient information. • Pressing this button a second time clears the screen. • Pressing this button aborts an active blood pressure measurement and deflates the cuff.
D	Print Button	Pressing this button initiates IR output to an external device.
E	Mode Button	• Pressing this button for 2 seconds while the display is active turns off/on the backlight. • Pressing this button while the device is in Standby Mode recalls the last patient information. • With the temperature probe removed from the probe holder, pressing the Mode button switches the temperature from Oral to Axillary Mode.
F	Pressure Hose Connector	Connector for blood pressure hose.

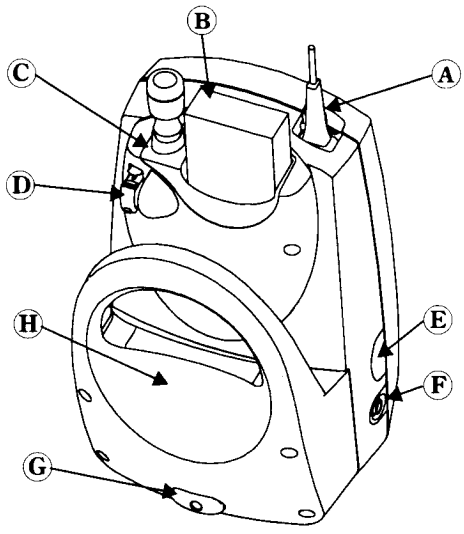
LCD (Liquid Crystal Display)

The liquid crystal display may indicate any of the following: systolic blood pressure (mmHg or kPa), diastolic blood pressure (mmHg or kPa), temperature (°F or °C), temperature method, pulse rate, pulse signal level, SpO_2, MAP, and battery charge level.



	Description	Function
G	Systolic Display	This LCD shows the systolic blood pressure. If MAP is turned on, the screen toggles between the systolic value and the word "MAP."
H	Diastolic Display	This LCD shows the diastolic blood pressure. If MAP is turned on, the screen toggles between the diastolic value and MAP value.
I	SpO_2 Display	Shows the percent saturation of arterial hemoglobin (SpO_2).
J	Pulse Signal Bar Graph	The bar graph gives a visual indication of the strength and quality of the pulses detected by the SpO_2 sensor.
K	Pulse Display	Shows the pulse rate.
L	Temperature Display and Indicator	Shows the temperature in degrees Fahrenheit or Celsius.
M	Thermometer Probe Setting Indicator	Shows a stick figure to indicate probe setting (oral, axillary, or rectal).
N	Temperature Probe Problem Indicator	Displays a broken probe icon to indicate a temperature probe problem.
O	Battery Charging Indicator	Displays a plug icon when the device is powered through the AC power transformer.
P	Battery Level Indicator	Continuously displays a battery icon with segments to show the battery power level. The segments indicate the charge level of the battery. A fully charged battery has all segments illuminated. As the battery level drops, segments turn off. While the internal battery is charging, the icon segments continuously sequence.

Top, Side, and Rear Panel Connections



	Description	Function
A	SpO_2 Sensor Connection	9 pin connector for the SpO_2 sensor.
B	Probe Cover Storage Compartment	Convenient storage space for one box of probe covers.
C	Temperature Probe Holder	The active temperature probe is inserted here when not in use. Removing and replacing the probe turns the temperature on and off, respectively.
D	Temperature Probe Connector	Connector for oral probe.
E	IR Data Interface	Port for communicating with an external device.
F	Transformer Power Connector	AC power transformer connector.
G	Threaded Insert	Mounts the Spot Vital Signs to a mobile stand.
H	Battery Compartment	Contains the internal battery. Remove the 4 screws to change the battery without affecting other internal parts.

Setup Procedure

AC Power Connection

The Welch Allyn Spot Vital Signs may be powered by either AC power or battery power after the battery has been charged.

To install the AC power transformer, insert the round transformer connector into the power port on the side of the Spot Vital Signs. Insert the connector into the port until it is fully seated. Insert the line cord into the line connector on the transformer. Plug the line cord into the AC main power source.

Charging the Battery

UPON RECEIVING THE SPOT VITAL SIGNS, CHARGE THE BATTERY FOR SIXTEEN (16) HOURS PRIOR TO INITIAL USE.

The battery is charged by attaching the AC power transformer to the Spot Vital Signs and plugging the AC power transformer into the AC main power source.

While the Spot Vital Signs is charging, the charger icon remains on and the battery icon segments continuously sequence. When the battery is fully charged, all battery icon segments are displayed continuously.

Setting the Date and Time

1. Initiate the Spot Vital Signs internal configuration settings menu by powering on the unit while pressing and holding the Blood Pressure Start/Stop button. The first message displayed is the revision level of the internal software.
2. Press the Mode button to advance to the Date Set Screen. The day, month, and year appear in the systolic, diastolic, and heart rate displays, respectively.
3. Use the Mode button to select the date item to be changed. When selected, the date item flashes.
4. Use the Next Patient/Clear/Cancel and Blood Pressure Start/Stop buttons (arrow up or arrow down) to change the selected date item.
5. After making all the desired date changes, press the Mode button ONCE to save the changes and advance to the Time Set Screen.
6. When in the Time Set Screen, the hour (in 24-hour format) and minutes appear in the systolic and diastolic displays, respectively. Use the Mode button to select the time item to be changed. When selected, the time item flashes. Use the Next Patient/Clear/Cancel and Blood Pressure Start/Stop buttons to set the time (in the same manner as described in step 4).
7. When the time is set as desired, press the Mode button once to save the time and advance to the next screen.
8. Press the green Power button to turn off the Spot Vital Signs.

Blood Pressure Hose and Cuff Connections

Identify and have each of the following items available:

- The Welch Allyn Spot Vital Signs
- One-piece blood pressure cuff
- Pressure hose

Perform the following set-up procedures:

1. Inspect the pressure hose; note that one end has a connector fitting and the other end does not. Attach the end without the connector to the pressure hose connector on the front of the Spot Vital Signs. Verify that the pressure hose is completely inserted over the connector and that the fit is snug.
2. Join the other end of the pressure hose to the pneumatic tubing attached to the cuff. Twist the connectors together until finger-tight. ***DO NOT OVERTIGHTEN***.

Temperature Probe Connection

The Welch Allyn Spot Vital Signs is available with two probes — one for oral/axillary temperatures (blue), and one for rectal temperatures (red). The rectal probe is an accessory item that is ordered separately.

To install the temperature probe, press down on the tab on top of the connector and insert the connector into the temperature probe connector port on the back of the Spot Vital Signs. Make sure the connector clicks into place. The probe connector is only inserted one way, with the tab on top. Insert the temperature probe into the probe holder on the top of the Spot Vital Signs.

To remove the temperature probe, press down on the connector tab and slide the connector out.

SpO_2 Sensor Connection

The Welch Allyn Spot Vital Signs is available with a wide variety of SpO_2 sensors. The reusable finger clip sensor is shipped with the Spot Vital Signs. Order all other sensors separately as accessory items (see "Supplies And Accessories" on page 53).

Attach the Nellcor SpO_2 sensor to the pulse oximetry extension cable. Insert the connector end of the extension cable into the SpO_2 connector port on the top of the Spot Vital Signs. The extension cable is only inserted one way; match the shape and pin configuration of the connector to the port. Push the connector in until it is fully seated on the port.

Note: Only Nellcor SpO_2 sensors and accessories may be used with this configuration of the Welch Allyn Spot Vital Signs.

Quick Reference/Error Code Card

The Quick Reference/Error Code Card should be attached either to the Spot Vital Signs handle, the Mobile Stand, or the Wall Mount.

Power On/Off and System Check Procedure

Each time the Welch Allyn Spot Vital Signs is turned on, the unit performs an internal diagnostic self check.

To turn the unit on, press the green Power button.

Upon power up, all the LCD segments in each display turn on briefly and a beep sounds. If the internal self-check is successful, the displays assume their normal functions and the device is ready for operation. If the self-check fails, an error code is shown on the display.

To turn the unit off, press the green Power button.

Note that turning the unit off erases stored blood pressure, temperature, SpO_2, and pulse rate data.

Standby Mode

When the device is powered up, but has not been used for 2 minutes, it goes into Standby Mode. "Z Z Z" appears across the top of the display with no backlight. Standby Mode conserves battery power.

To bring the Spot Vital Signs out of Standby Mode, press the Mode button.

Temperature Measurement Range Indicators

The following display appears when temperatures are outside of the measurement range of the device:

Condition	Temperature	Display
Temperature is outside of high measurement range of the device	Fahrenheit Celsius	109.4° ⇑ 43° ⇑
Temperature is outside of low measurement range of the device	Fahrenheit Celsius	86° ⇓ 30° ⇓

IMPORTANT: There is no audible tone to indicate that the temperature is outside the measurement range of the device. There is a visual indicator only.

Measuring Blood Pressure

Blood Pressure Cuff Selection

Note: An adult durable blood pressure cuff is included with your Spot Vital Signs. A full range of cuff sizes are available as accessory items; however, the adult durable cuff fits the majority of adults and gives the most accurate blood pressure measurement.

Careful sizing of the cuff is important to the accuracy of blood pressure readings. If the cuff is too small, you may have falsely high readings. Research has shown that an undersized cuff overestimates the true blood pressure by as much as 10 to 30 mmHg. If the cuff is too large, you may have falsely low readings. Please refer to the reference markings on the cuff for correct cuff sizing. When there is an area of overlap whereby you could use a smaller or larger cuff, it is strongly recommended that you use the larger size cuff.

You may find that the bottom of the cuff extends to the antecubital fossa (bend in the elbow) on many people, but because the device uses oscillometric technology, not auscultation, this does NOT result in an inaccurate blood pressure.

Determining Cuff Size with the Cuff Markings

One way to ensure proper cuff size is to wrap the cuff around the patient's upper arm and visually check it. The cuff is marked with a distinct white edge and two divisions that indicate "range." When the cuff is properly fit, the edge meets the cuff at some point within the range.

Chart for Determining Cuff Size

You can also determine cuff size by measuring the patient's arm circumference midway between the elbow and shoulder, then use the chart below to select the correct cuff.

Cuff Size	Reusable Two-Piece Cuff (1 per pack)	Maximum Range (cm)	Maximum Range (in)
Child	4500-01	20.8	8.2
Adult	4500-02	31.5	12.4
Large Adult	4500-03	38.4	15.1
Thigh	4500-04	47.4	18.7

Durable One-Piece Cuff (Single Unit)	Disposable One-Piece Cuffs (5 pack)	Cuff Size	Minimum (cm)	Maximum (cm)	Minimum (inches)	Maximum (inches)
5082-203-3	5082-93-3	Small Child	12.4	16.8	4.9	6.6
5082-204-3	5082-94-3	Child	15.8	21.3	6.2	8.4
5082-205-3	5082-95-3	Small Adult	20.0	27.0	7.9	10.6
5082-206-3	5082-96-3	Adult	25.3	34.3	10.0	13.5
5082-207-3	5082-97-3	Large Adult	32.1	43.4	12.6	17.1
5082-208-3	5082-98-3	Thigh	40.7	55.0	16.0	21.7

Two-Piece Cuff	Cuff Size	Maximum (cm)	Maximum (inches)
5200-03	Child	20.8	8.2
5200-01	Adult	31.5	12.4
5200-02	Large Adult	38.4	15.1
5200-10	Thigh	47.4	18.7

THE WELCH ALLYN SPOT VITAL SIGNS IS NOT INTENDED TO FOR USE ON NEONATAL PATIENTS.

To ensure pediatric blood pressure accuracy and safety, the Welch Allyn Child Print Cuff (5200-03), the Welch Allyn Small Child Durable One-Piece Cuff (5082-203-3), and the Welch Allyn Small Child Disposable One-Piece Cuff (5082-93-3) are the smallest cuffs allowed for use with young children and infants. The circumference of the child's arm must fit within the range markings on the cuff.

Positioning the Cuff

The preferred blood pressure measurement site for adults and children is the upper arm. Keep the patient's arm relaxed and motion-free during measurement(s). Alternate blood pressure measurement sites include the ankle or forearm.

Warning: Do not place the cuff on any extremity that is used for intravenous infusions or any area where circulation is compromised.

Note: Cuff inflation during an SpO_2 measurement may cause inaccurate SpO_2 results when used on the same arm.

Wrap the cuff snugly with room between the cuff and the arm for two fingers. Excessive tightness may cause venous congestion and discoloration of the limb. Possible error may occur if the cuff is wrapped too loosely, preventing proper inflation.

It is best to place the cuff on a bare arm. Clothing interferes with measurement accuracy.

When wrapping the cuff, observe the mark on the cuff that is placed over the artery. Ensure that the hose is not twisted, kinked, or compressed, as this may cause measurement errors.

Manual Blood Pressure Measurement

To initiate blood pressure measurements on demand:

1. Ensure that the blood pressure cuff is properly sized and wrapped around the patient's upper arm (or alternate site, as necessary).
2. With the device powered on, press the Blood Pressure Start/Stop button. The Spot Vital Signs inflates the cuff to the appropriate level.

3. The systolic display shows the pressure in the cuff as the blood pressure determination is in process.
4. When the measurement cycle is complete, the systolic, diastolic, and pulse rate* are displayed.
5. The blood pressure reading is displayed for 2 minutes, then disappears (unless another measurement is active). Pressing the Mode button recalls the blood pressure reading.
6. Pressing the Blood Pressure Start/Stop or the Next Patient/Clear/Cancel button at any time during a blood pressure determination aborts the measurement and rapidly deflates the cuff.

* Pulse rate, as determined from the blood pressure measurement method, is displayed with the BP reading only if the SpO_2 option is absent or disabled. If the SpO_2 function is operational, all pulse rate determinations are a result of the SpO_2 measurement method.

Reviewing Information from the Last Cycle

The Spot Vital Signs holds the last patient vital signs data (blood pressure, pulse rate, and/or temperature and/or SpO_2) in memory. The information is held in memory until the unit is turned off or you initiate the next patient's measurement. If the display is blank, press the Mode button to review data from the last vital signs measurement. The most recently obtained data appears in the appropriate displays.

Setting the Default Inflation Pressure Preset Level

The default cuff inflation level for blood pressure measurements is set in the Spot Vital Signs internal configuration menu. The factory default level is 160 mmHg. If desired, change the default pressure preset by following these instructions:

1. Turn the Spot Vital Signs off.
2. Press both the Power button and the Blood Pressure Start/Stop button simultaneously. The device enters its internal configuration mode.

3. Press the Mode button to cycle through the menu until you see "PRP" appear in the systolic display and the pressure default level appears in the diastolic display.
4. Press the Next Patient/Clear/Cancel or Blood Pressure Start/Stop button to cycle through the 7 options available: 120, 140, 160, 180, 200, 240, and 280 mmHg.
5. When the desired pressure preset level is illuminated, press the Mode button once to save this change.
6. Turn the device off.

When the device is turned on, the new pressure preset is established as the default level. The device always reverts to this pressure preset level.

Caution: When measuring blood pressure on children younger than age 3, it is recommended that the Pressure Preset (initial inflation pressure) be set at 160 mmHg or lower.

Setting Change Between mmHg and kPa

The default setting for mmHg or kPa depends on the country the Spot Vital Signs device is being shipped to. The default setting is mmHg for all countries except China. The default setting for China is kPa. If desired, change the default setting by following these instructions:

1. Turn the Spot Vital Signs off.
2. Simultaneously press both the Power button and the Blood Pressure Start/Stop button. The device enters its internal configuration mode.
3. Press the Mode button to cycle through the menu until you see BP in the systolic display. The diastolic display will show an "mm" for mmHg.
4. Press the Next Patient/Clear/Cancel or Blood Pressure Start/Stop button to change the default setting.
5. Press the Mode button once to save this change.
6. Turn the device off.

Mean Arterial Pressure (MAP) Mode

You may turn on or off the Mean Arterial Pressure (MAP) mode by entering the internal configuration mode:

1. Turn the Spot Vital Signs off.
2. Press both the Power and Blood Pressure Start/Stop buttons simultaneously. The device enters its internal configuration mode.
3. Press the Mode button to cycle through the menu until you reach the MAP option screen.
4. Pressing the Blood Pressure Start/Stop or the Next Patient/Clear/Cancel button turns the MAP on or off. When the desired functionality is displayed, press the Mode button once to save this change.
5. Turn the device off.
6. When the device is turned on, the desired MAP functionality is established.

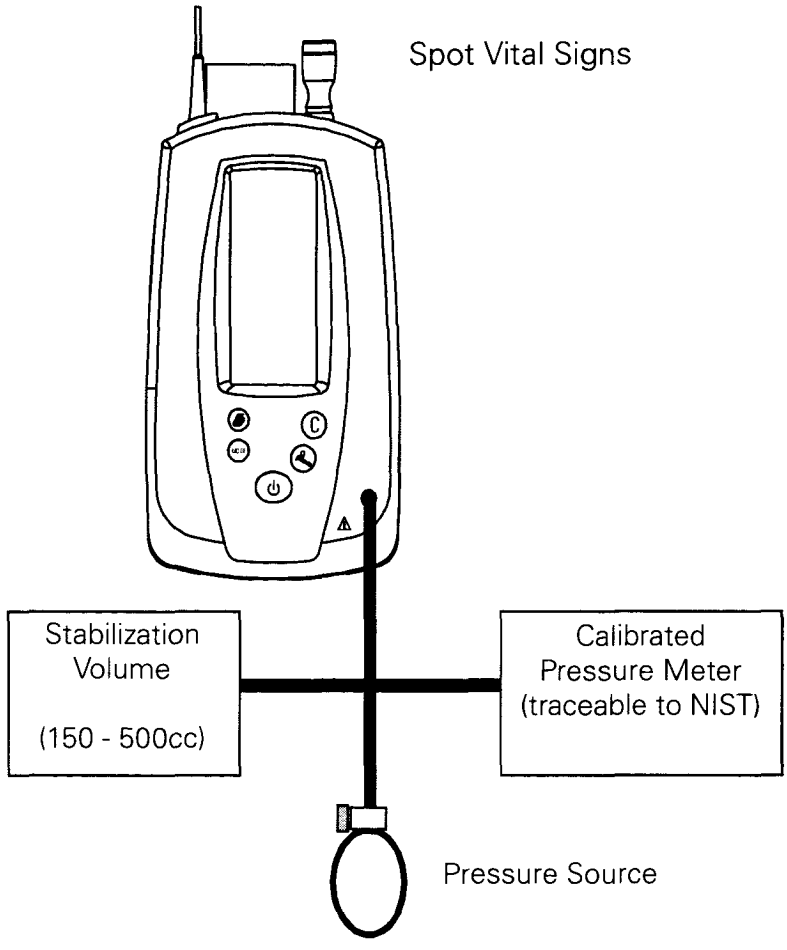
Blood Pressure Calibration Check

The Welch Allyn Spot Vital Signs is manufactured to the highest industry standards for quality and accuracy. The device is manufactured using calibrated pressure standards traceable to NIST (National Institute of Standards and Technology). Welch Allyn recommends that blood pressure calibration for the Spot Vital Signs is checked on an annual basis using the following procedure.

Put the Spot Vital Signs into its blood pressure calibration check mode. In this mode, the device will continuously display the measured pressure and the pressure release valve is closed.

1. Turn the Spot Vital Signs off.
2. Simultaneously press both the Power button and the Blood Pressure Start/Stop button. The device enters its internal configuration mode.
3. Press the Mode button two times to enter calibration check mode. The device will show "Cal" in the systolic display and the current pressure in the diastolic display.
4. Press the Blood Pressure Start/Stop button to close the device's internal valve to apply an external pressure.
5. Connect the Spot Vital Signs as shown. **Make sure the pressure meter used to test the Spot Vital Signs is calibrated and that the calibration certificate for the pressure meter is traceable to the National Institute of Standards and Technology. The pressure meter testing the Spot Vital Signs must have an accuracy of better than ±3 mmHg.** Use a fixed volume or a cuff wrapped around a cylinder for the stabilization volume.
6. Pressurize the Spot Vital Signs to slightly above 250 mmHg and bleed down the pressure no faster than 10 mmHg per second, stopping to **check the pressure at 250, 150, and 50 mmHg.** Record the readings of the device and the pressure measurement standard at each pressure.
7. Calculate the difference between the readings from the Spot Vital Signs and the pressure measurement standard at each of the specified pressures. Subtract the rated accuracy of the pressure measurement standard from the ±3 mmHg rated accuracy of Spot Vital Signs. This is the **pass/fail criteria** to determine if the device is within calibration or not. If the differences between Spot

Calibration Check Set-up



Vital Signs and the pressure measurement standard are within the pass/fail criteria at all specified pressures, then the device is within calibration.

If the Spot Vital Signs is out of calibration, it needs re-calibration. Calibration procedures are included in the Spot Vital Signs Service Manual. Alternatively, send the device back to Welch Allyn for calibration by contacting Technical Service.

NOTE: The pass/fail criteria for the blood pressure calibration check depends upon the accuracy of the pressure measurement standard used. For example:

- If the pressure measurement standard used is rated with an accuracy of ±0.1 mmHg, the pass/fail criteria is ±2.9 mmHg in order to guarantee that the instrument under test is within ±3 mmHg of NIST.
- If the pressure measurement standard used is rated with an accuracy of ±1.0 mmHg, the pass/fail criteria is ±2.0 mmHg in order to guarantee that the instrument under test is within ±3 mmHg of NIST.

Welch Allyn recommends using a pressure meter that is as accurate as possible when performing calibration checks. Welch Allyn offers two different pressure measurement standards for use:

- Setra Pressure Meter, calibrated accuracy of ±0.1 mmHg (part no. 2270-01)
- Netech Pressure Meter, calibrated accuracy of ±1.0 mmHg (part no. 200-2000IN)

Use of other pressure measurement standards is acceptable, provided they have an accuracy of better than ±3 mmHg, are traceable to NIST, and have a current calibration.

NOTE: Do not take more than 3 minutes to take the readings, as the Spot Vital Signs will open its pressure relief valve as a safety feature. If this occurs, turn the device off and start over.

NOTE: The Spot Vital Signs has the option to measure pressure in kPa units. If the device is set to kPa instead of mmHg, temporarily set the device to mmHg units or convert all pressures to kPa units.

Measuring Temperature

Selecting the Temperature Scale

The Welch Allyn Spot Vital Signs can display temperature in either degrees Fahrenheit (°F) or degrees Celsius (°C). To determine the current temperature scale, remove the temperature probe from its holder and view the Temperature display, which shows either "°F" or "°C."

To change the temperature scale, you must enter the device's internal configuration mode:

1. Turn the Spot Vital Signs off.
2. Press both the Power and Blood Pressure Start/Stop buttons simultaneously. The device enters its internal configuration mode.
3. Press the Mode button to cycle through the menu until you reach the temperature option screen.

4. The first option illuminated on the temperature display is "°F." Pressing the Next Patient/Clear/Cancel button once illuminates "°C."
5. When the desired temperature scale is selected, press the Mode button once to save this change.
6. Turn the device off.

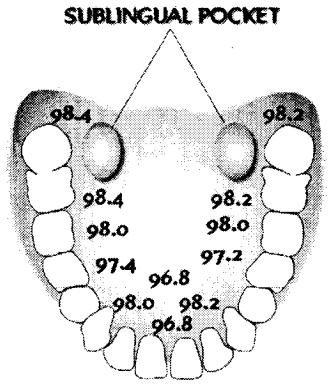
When the device is turned on, the new temperature scale is established as the default scale. The device always reverts to this temperature scale.

Selecting Temperature Operation Mode

When configured with the temperature option, the Welch Allyn Spot Vital Signs takes a temperature in either Normal or Monitor Mode.

In the Normal Mode, the thermometer's microprocessor "predicts" body temperature in approximately 4 seconds for oral temperatures, 10 seconds for axillary temperatures, and 15 seconds for rectal temperatures.

For accurate oral temperatures, place the oral probe in the posterior medial sublingual pocket.



Monitor Mode is normally used when difficult situations prevent taking an accurate temperature in the Normal Mode. In Monitor Mode, maintain probe contact with the tissue for at least 3 minutes for accurate oral/rectal temperature measurement, and 5 minutes for accurate axillary temperature measurement.

The default setting for the Spot Vital Signs thermometer is Normal Mode.

Note: Normal Mode axillary temperatures are FDA cleared for children under the age of four.

THE WELCH ALLYN SPOT VITAL SIGNS IS NOT INTENDED FOR USE ON NEONATAL PATIENTS.

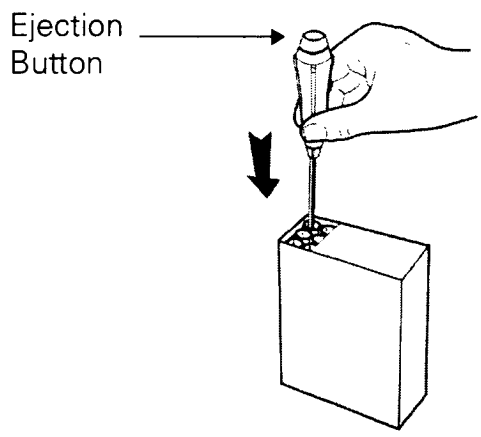
Taking an Oral Temperature

To take an oral temperature in either Normal or Monitor Mode:

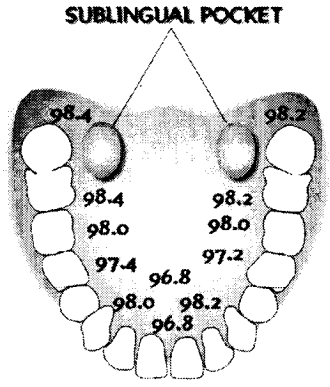
Oral Normal Mode

1. Ensure that the oral probe is connected to the unit. The oral probe is BLUE. Accurate oral temperatures are obtained only by using the blue temperature probe.

2. Remove the probe from the probe holder. A short self-test mode is initiated where every LCD segment on the temperature display is illuminated briefly. Following this self-test, the display shows "OrL" indicating the oral probe is in use.
3. Once "OrL" is displayed, load a probe cover onto the probe by holding the probe collar with the thumb and forefinger, careful not to hold or press the ejection button.



4. Insert the probe tip gently into the patient's slightly opened mouth. Carefully slide the probe under the tongue on either side of the mouth to reach the posterial medial sublingual pocket (see illustration). Accurate temperatures are obtained only in this location. Temperatures in other mouth locations can vary by as much as 2°F or 1°C.



5. ***Hold the probe during the entire temperature measurement process to ensure the probe tip maintains tissue contact.***
6. During the temperature measurement cycle, the temperature display shows a series of LCD segments in a box-shaped formation. This indicates that the temperature measurement is in process.
7. When the final temperature is reached, a beep sounds and the temperature is displayed.
8. After the temperature measurement is complete, remove the probe from the patient's mouth and eject the probe cover by firmly pressing the ejection button on the probe. Dispose of the used probe cover properly.
9. Insert the probe into the probe holder before attempting to take another temperature measurement.
10. In Normal Mode, the current temperature is displayed for 2 minutes after the probe is placed back in the holder. The display then disappears (unless another measurement is active). You may recall the last patient reading by pressing the Mode button.

Note: If a probe position icon appears during the temperature determination, the temperature display alternates between the final predicted temperature and the letter "P."

Oral Monitor Mode

1. Remove the probe from the probe holder and take an oral predictive (the temperature display must show "OrL").
2. When the thermometer is finished and a temperature is displayed, leave the probe in place and press the Mode button once. An "M" appears on the temperature display to indicate Monitor Mode.
3. Maintain probe contact with the tissue for at least 3 minutes to obtain an accurate oral Monitor Mode temperature.

4. Record the Monitor Mode temperature before placing the probe back in the probe holder. The Spot Vital Signs does not save the Monitor Mode temperature.

If the thermometer is in Normal Mode, you may easily switch to Monitor Mode without taking a predictive temperature first. To do this, remove the probe from the probe holder, attach a new probe cover, and wait one minute (do not place probe in patient's mouth, underarm, or rectum at this time). After one minute, the thermometer automatically switches to Monitor Mode and an "M" is displayed. You may now proceed to take the patient's temperature. After the probe is replaced in the holder, the device reverts back to Normal Mode.

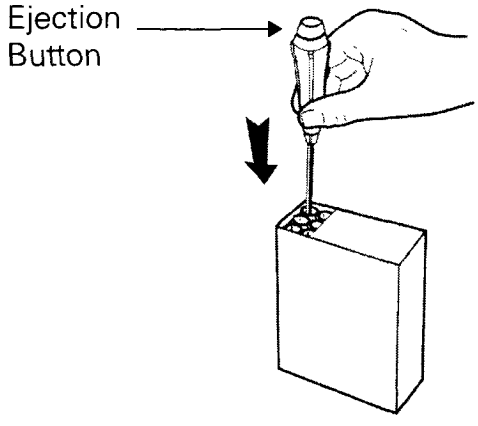
Taking an Axillary Temperature

NOTE: The Welch Allyn Spot Vital Signs is FDA cleared to measure the axillary temperature in Normal Mode for children under the age of 4. Normal Mode axillary temperatures may not be accurate on older children or adults. *THE WELCH ALLYN SPOT VITAL SIGNS IS NOT INTENDED FOR USE ON NEONATAL PATIENTS.*

To take an axillary temperature in either Normal or Monitor Mode:

Axillary Normal Mode

1. Ensure that the oral probe is connected to the unit. The oral probe is BLUE. Accurate axillary temperatures are obtained only by using the blue temperature probe.
2. Remove the probe from the probe holder. A short self-test mode is initiated where every LCD segment on the temperature display is illuminated briefly. Following this self-test, the display shows "OrL" indicating the oral probe is in use.
3. Press the Mode button once and the LCD shows "ALY, " indicating that the device is now ready to take an axillary temperature reading. Note that subsequent presses of the Mode button toggle between the oral and axillary modes of operation. The device's display must show "ALY" prior to the initiation of an axillary temperature measurement.
4. With the temperature display showing "ALY, " load a probe cover onto the probe by holding the probe collar with the thumb and forefinger, careful not to hold or press the ejection button.



5. Lift the patient's arm so that the entire axilla is easily seen. Place the probe as high as possible in the axilla. Do not allow the probe tip to come into contact with the patient until it is deliberately placed in the measurement site. Any tissue contact before this time activates the probe position message and may cause inaccurate temperature readings.
6. Verify that the probe tip is completely surrounded by axillary tissue. Clothing or other material touching the probe tip may cause inaccurate readings.
7. Place the arm snugly at the patient's side. Hold the arm in this position without movement of the arm or probe during the measurement cycle. Moving the arm may cause inaccurate

readings. Hold the probe in place during the temperature measurement process to ensure the probe tip maintains tissue contact.

8. In Normal Mode, the Spot Vital Signs beeps and displays the temperature reading when a final temperature is reached. This takes approximately 10 seconds.
9. After the temperature measurement is complete, remove the probe from the patient's axilla and eject the probe cover by firmly pressing the ejection button on the probe. Dispose of the used probe cover properly.
10. Insert the probe into the probe holder before attempting to take another temperature measurement.
11. In Normal Mode, the current temperature is displayed for 2 minutes after the probe is placed back in the holder. The display then disappears (unless another measurement is active). You may recall the last patient reading by pressing the Mode button.

Note: If a probe position icon appears during the temperature determination, the temperature display alternates between the final predicted temperature and the letter "P."

Axillary Monitor Mode

1. Remove the probe from the probe holder and take an axillary predictive temperature (the temperature display must show "ALY").
2. When the thermometer is finished and a temperature is displayed, leave the probe in place and press the Mode button once. An "M" appears on the temperature display to indicate Monitor Mode.
3. Maintain probe contact with the tissue for at least 5 minutes to obtain an accurate axillary Monitor Mode temperature.
4. Record the Monitor Mode temperature before placing the probe back in the probe holder. ***The Spot Vital Signs does not save the Monitor Mode temperature.***

If the thermometer is in Normal Mode, you can easily switch to Monitor Mode without taking a predictive temperature first. To do this, remove the probe from the probe holder, attach a new probe cover, and wait one minute (do not place probe in patient's mouth, underarm, or rectum at this time). After one minute the thermometer automatically switches to Monitor Mode. You may now proceed to take an axillary temperature. After the probe is replaced in the holder, the device reverts back to Normal Mode.

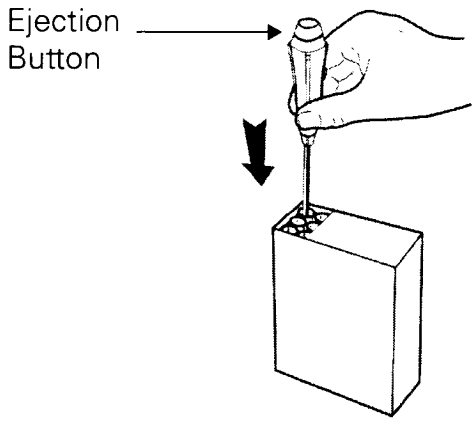
Taking a Rectal Temperature

To take a rectal temperature in either Normal or Monitor Mode:

Rectal Normal Mode

1. Ensure that the rectal probe is connected to the Spot Vital Signs. The rectal probe has a RED tip. Accurate rectal temperatures are obtained only by using the red temperature probe.
2. Remove the probe from the probe holder. A short self-test mode is initiated where every LCD segment on the temperature display is illuminated briefly. Following this self-test, the display shows "Rec," indicating the rectal probe is in use. The display must show "Rec" prior to the initiation of a rectal temperature measurement.

3. Once "Rec" is displayed, load a probe cover onto the probe by holding the probe collar with the thumb and forefinger, careful not to hold or press the ejection button.



4. Apply a thin coat of water-based lubricant when necessary. Separate the buttocks with one hand. Using the other hand, gently insert the probe ONLY 1 cm (5/8 inch for adults, and 1/2 inch for infants and children) inside the rectal sphincter. Use extreme caution to avoid risk of bowel perforation in children.
5. Tilt the probe to ensure good tissue contact. Keep hands separating buttocks in place, hold the probe in place during the entire measurement process.
6. During the temperature measurement cycle, the temperature display shows a series of LCD segments in a box-shaped formation. This indicates that the temperature measurement is in process.
7. When the final temperature is reached, a beep sounds and the temperature is displayed. This takes approximately 15 seconds.
8. After the temperature measurement is complete, remove the probe from the patient's rectum and eject the probe cover by firmly pressing the ejection button on the probe. Dispose of the used probe cover properly.
9. Insert the probe into the probe holder before attempting to take another temperature measurement.
10. The current temperature is displayed for 2 minutes after the probe is placed back in the holder. The display then disappears (unless another measurement is active). You may recall the last patient reading by pressing the Mode button.

Note: If a probe position icon appears during the temperature determination, the temperature display alternates between the final predicted temperature and the letter "P."

Rectal Monitor Mode

1. Remove the probe from the probe holder and take a rectal predictive temperature (the temperature display must show "Rec").
2. When the thermometer is finished and a temperature is displayed, leave the probe in place and press the Mode button once. An "M" appears on the temperature display to indicate Monitor Mode.
3. Maintain probe contact with the tissue for at least 3 minutes to obtain an accurate rectal Monitor Mode temperature.
4. Record the Monitor Mode temperature before placing the probe back in the probe holder. ***The Spot Vital Signs does not save the Monitor Mode temperature.***

If the thermometer is in Normal Mode, you can easily switch to Monitor Mode without taking a predictive temperature first. To do this, remove the probe from the probe holder, attach a new probe cover, and wait one minute (do not place probe in patient's mouth, underarm, or rectum at this time). After one minute the thermometer automatically switches to Monitor Mode. You may

now proceed to take a rectal temperature. After the probe is replaced in the holder, the device reverts back to Normal Mode.

Measuring SpO_2

The Spot Vital Signs incorporates the pulse oximetry system which determines arterial oxyhemoglobin saturation (SpO_2%). Spot Vital Signs uses pulse oximetry to measure functional oxygen saturation in the blood. Pulse oximetry works by applying a sensor to a pulsating arteriolar vascular bed, such as a finger or toe. The sensor contains a dual light source and a photo detector.

Bone, tissue, pigmentation, and venous vessels normally absorb a constant amount of light over time. The arteriolar bed normally pulsates and absorbs variable amounts of light during the pulsations. The ratio of light absorbed is translated into a measurement of functional oxygen saturation (SpO_2).

Because a measurement of SpO_2 is dependent upon light from the sensor, excessive ambient light can interfere withthis measurement.

Pulse oximetry is based on two principles: that oxyhemoglobin and deoxyhemoglobin differ in their absorption of red and infrared light (spectrophotometry), and that the volume of arterial blood in tissue (and hence, light absorption by that blood) changes during the pulse (plethysmography). A pulse oximeter determines SpO_2 by passing red and infrared light into an arteriolar bed and measuring changes in light absorption during the pulsatile cycle. Red and infrared low-voltage light-emitting diodes (LED) in the oximetry sensor serve as light sources; a photo diode serves as the photo detector.

Because oxyhemoglobin and deoxyhemoglobin differ in light absorption, the amount of red and infrared light absorbed by blood is read to hemoglobin oxygen saturation. To identify the oxygen saturation of arterial hemoglobin, the device uses the pulsatile nature of arterial flow. During systole, a new pulse of arterial blood enters the vascular bed, and blood volume and light absorption increase. During diastole, blood volume and light absorption reach their lowest point. The pulse oximeter bases its SpO_2 measurements on the difference between maximum and minimum absorption (measurements at systole and diastole). By doing so, it focuses on light absorption by pulsatile arterial blood, eliminating the effects of nonpulsatile absorbers such as tissue, bone, and venous blood.

Oxygen saturation percent is calculated with each pulse detected, and the Spot Vital Signs display is continually updated. The pulse signal bar graph is an indicator of the strength and quality of the detected pulses.

SpO_2 is normally measured via pulses detected using a finger clip sensor. For certain situations, measurement and alternate site measurements for SpO_2 can include the earlobe, forehead, and toes. Use special sensors in these situations.

Factors that may degrade the performance of the pulse oximeter:

- Excessive ambient light
- Electrosurgical interference
- Moisture in the sensor
- Incorrect sensor for patient
- Venous pulsations
- Cardiovascular dyes
- Sensor not at heart level
- Excessive motion
- Arterial catheters, blood pressure, and infusion lines, etc.
- Improperly attached sensor
- Poor patient perfusion
- Anemia or low hemoglobin concentrations
- Fingernail polish (if finger sensor is used)

Automatic Calibration

Because light absorption by hemoglobin is wavelength dependent and because the mean wavelength of LEDs varies, an oximeter must know the mean wavelength of the sensor's red LED to accurately measure SpO_2.

During measurement, the instrument's software selects coefficients that are appropriate for the wavelength of that individual sensor's red LED; these coefficients are then used to determine SpO_2.

Additionally, to compensate for differences in tissue thickness, the light intensity of the sensor's LEDs is adjusted automatically.

OxiMax Technology

Spot Vital Signs is designed to use Nellcor *OxiMax* brand sensors which integrate the *OxiMax* technology. These sensors are identified by their deep blue plug color. All *OxiMax* sensors contain a memory chip carrying information about the sensor, which the oximeter needs for correct operation, including the sensor's calibration data, model type, troubleshooting codes, and error detection data. This unique oximetry architecture enables several new features with Spot Vital Signs.

When an *OxiMax* sensor is connected to Spot Vital Signs, the pulse oximeter will first read the information in the sensor memory chip, check it to make sure that there are no errors, and then load the data to begin measurement.

Using the Finger Clip Sensor

Warning: Use only Nellcor brand SpO_2 sensors and accessories with Welch Allyn's Spot Vital Signs.

The finger clip pulse oximeter sensor is designed for spot check measurements of pediatric and adult patients.

Insert the patient's finger (preferably left or right index finger) completely into the sensor. The thumb is specifically not recommended for use with the finger clip sensor.

Note: If blood pressure measurement is occurring simultaneously, ensure that the SpO_2 finger clip sensor is attached to the limb opposite the limb with the blood pressure cuff.

Note: Check sensor sites periodically to determine circulation, sensor positioning, and skin sensitivity.

Other Sensors

A wide variety of reusable and disposable pulse oximetry sensors are available for use with the Welch Allyn Spot Vital Signs. These sensors expand the utility of the pulse oximetry component of the device.

Warning: Use only Nellcor brand SpO_2 sensors and accessories with Welch Allyn's Spot Vital Signs configured with the Nellcor pulse oximetry module.

Taking an SpO_2 Measurement

To take an SpO_2 measurement:

1. Properly attach the appropriate sensor to the patient.
2. The pulse signal bar graph illuminates, indicating the relative strength and quality of the patient's pulses at the sensor site. The sensor takes approximately 10 seconds to determine the initial SpO_2% value and pulse rate. When the initial values are determined, they are shown in the SpO_2 display and the Pulse Rate display, respectively.
3. The SpO_2% and pulse rate are updated approximately every second. The Spot Vital Signs monitors a patient's SpO_2 for up to 10 minutes. After 10 minutes, a C9 error code is displayed. This error code means that the 10-minute time limit has been exceeded.
4. Removing the SpO_2 sensor from the patient ends the measurement period, and the pulse signal bar graph blanks.

Troubleshooting

Error Indications and Interpretation

The following table of conditions and error codes provides a quick reference of the descriptions and probable causes of error codes. For service-level troubleshooting, refer to the service manual.

Press the Blood Pressure Start/Stop button to reset flashing patient alarm conditions.

General Error Codes		
Code	**Description**	**Corrective Action**
E11	Internal safety violation	Check patient, contact Technical Service.
C12	Ambient temperature out of range	Adjust ambient temperature or device location.
C13	Battery failure	Use wall transformer.
E0.0 - E9.9	Temperature module malfunction	Contact Technical Service.
E38	Date and time not set	Set the Date and Time, see "Setting the Date and Time" on page 27.

General Error Codes		
Code	**Description**	**Corrective Action**
E42	Internal communications error	Disconnect the battery and wait 5 minutes. Reconnect the battery and then set the date and time, see "Setting the Date and Time" on page 27.
E20 - E50	General internal malfunction	Contact Technical Service.

Blood Pressure Error Codes		
Code	**Description**	**Corrective Action**
C02	Auto-zero failure	Check for air obstruction, limit patient movement.
C03	Inflation too rapid	Check for kinked cuff tubing, pressure hose, or other air obstruction.
C04	Excessive inflation time	Check for air leaks.
C05	Excessive noise	Check patient condition, cuff placement, limit patient movement.
C06	Measurement was outside of device's measurement range	Check patient condition.
E10	Cuff overpressure condition	Check patient condition.

Temperature Error Codes		
Code	**Description**	**Corrective Action**
C20	Broken/missing probe	Replace probe.
P	Loss of tissue contact	Ensure proper probe positioning.
E0.2, E0.3	Ambient temperature out of range	Adjust ambient temperature or device location.
C22	10-minute diagnostic limit exceeded	Check patient. Read Operator's Manual. Verify that the device is not used for monitoring purposes.

SpO_2 Error Codes		
Code	**Description**	**Corrective Action**
E7	Internal malfunction	Contact Technical Service.
C9	10-minute diagnostic limit exceeded	Check patient. Press Next Patient/Clear/ Cancel button to clear error code. Verify that the device is not used for monitoring purposes.
C6	SpO_2 heart rate out of range	Check patient condition.
C8	Bad sensor	Replace sensor.

General Guide to Problems and Corrective Actions

Quick Guide to Taking Manual (Auscultatory) Blood Pressure

Action	Explanation
Use a certified accurate sphygmomanometer and quality stethoscope.	Many sphygmomanometers are inaccurate. Low-quality stethoscopes do not transmit sound well enough to accurately hear blood pressure sounds.
Select a blood pressure cuff of a suitable size. Use a blood pressure cuff of the largest appropriate size for patient (see markings on inside of cuff).	A cuff that is either too large or too small may cause inaccurate readings.
Have the patient assume a comfortable position with the upper arm relaxed at heart level and the lower arm passively supported.	Inaccurate readings result if the arm is not at the proper level.
Expose the area of the brachial artery by removing clothing, or move a sleeve, if not too tight, above the area where the cuff is placed.	Clothing over the artery hinders the ability to hear and may cause inaccurate readings. Tight clothing may cause vessel congestion and inaccurate readings.
Center the cuff bladder so the lower edge is at least 1 inch (2.5 cm) above the bend of inner arm of the elbow.	This places the cuff in the best position for occluding the blood flow through the brachial artery.
Palpate the brachial or radial pulse.	Determines the most accurate location for assessment and approximation of systolic pressure.
Inflate the cuff until the pulsation disappears. Continue to inflate until the pressure reads 30 mmHg above the point where the pulse disappeared.	Facilitates identification of Phase One Korotkoff sounds.
Listen carefully with stethoscope over brachial artery while controlling the release of air at a rate of 3 mmHg per second.	One of the major sources of error in auscultatory blood pressure measurement is deflating the cuff too quickly. It is a normal operation of the Welch Allyn Spot Vital Signs to deflate at the American Heart Association recommended 3 mmHg per second.
Systolic is determined by reading the manometer gauge when the first faint but clear tapping sound is heard with the stethoscope.	Follows AHA recommended standards.
Diastolic, in adults, is determined by reading the manometer gauge to the closest even number when the last sound is heard. Release the air quickly after at least 10 to 20 mmHg of silence.	Diastolic blood pressure in children is the point at which the sound becomes muffled.

SYMPTOM: Inaccurate Blood Pressure Readings

Note: Differences of up to 10 mmHg are considered normal and occur for a number of reasons including intra-patient BP variability, observer hearing differences, and auscultatory deflation rate.

Possible Cause	Explanation and Corrective Action
Incorrect cuff size. Use Welch Allyn approved cuffs only.	Determine correct cuff size. • Use reference markings on cuff. • Measure patient's arm circumference midway between elbow and shoulder (see "Chart for Determining Cuff Size" on page 31 to select correct cuff size).
Patient's arm position	Ensure patient's arm is at heart level.
Arm movement during blood pressure cycle	Keep arm still during blood pressure cycle. • Movement may cause inaccuracies from artifact.
Blood pressure taken over clothing	Take blood pressure on a bare arm.
Arrhythmia	Check for regularity of heart rate (palpate pulse or check device). • Moderate to severe heart rate irregularities may make blood pressure difficult to measure.
Incorrect reference	Use the correct Korotkoff sound to determine diastolic blood pressure. • Many listeners incorrectly equate diastolic blood pressure with the disappearance of sound only (phase 5). The Welch Allyn Spot Vital Signs was developed using the American Heart Association recommendations, which state that phase 5 be used unless sound continues to 0 mmHg, in which case the change in the quality of sound (phase 4) is to be used. Deflate cuff no faster than 3 mmHg per second. • One of the major sources of error in auscultatory blood pressure measurement is deflating the cuff too quickly. The American Heart Association recommends deflation no faster than 3 mmHg per second. Only use a sphygmomanometer that is calibrated. • An uncalibrated sphygmomanometer may take inaccurate blood pressure measurements.
Change in blood pressure between auscultatory reading and Welch Allyn Spot Vital Signs reading	Check blood pressure immediately prior to Welch Allyn Spot Vital Signs reading.
Poor auscultatory sound recognition by observer	Use higher quality stethoscope. Have a different observer check patient's blood pressure.

SYMPTOM: Cuff Inflation and Deflation with No Blood Pressure Reading Displayed (or Error Code in Display)

Possible Cause	Explanation and Corrective Action
Leak in pneumatic system	Ensure all cuff attachments are tight. Carefully check for leaks in the blood pressure cuff, tubing, and pressure hose attached to the device.
Arm movement during cycle	Keep arm still during blood pressure cycle. Movement may cause inaccuracies from artifact.
Cuff tubing or pressure hose movement artifact	Do not contact cuff tubing or pressure hose during blood pressure cycle. Movement may cause inaccuracies from artifact.

SYMPTOM: No Cuff Inflation

Possible Cause	Explanation and Corrective Action
Connections between device and cuff loose	Check all connections (do not overtighten).

SYMPTOM: Temperature Malfunction

Possible Cause	Explanation	Corrective Action
Error code displayed	Broken probe	Replace probe. Consult Service Manual. Notify biomedical department or Welch Allyn Technical Support.
Low temperature readings	Improper probe placement	Place probe in most posterior sublingual pocket when in Oral Mode.
No temperature displayed	Probe not replaced	Replace probe in holder prior to taking another temperature.

SYMPTOM: SpO_2 Malfunction

Possible Cause	Explanation	Corrective Action
Sensor in place but no SpO_2 on display	Improperly attached sensor	Insert the patient's finger completely into sensor. Verify BP and SpO_2 measurements are not taken on the same extremity.
	Cable incorrectly plugged into device	Ensure sensor cable is correctly plugged into device.
Inaccurate SpO_2 reading	Incorrect sensor	Ensure that correct manufacturer's sensor is in use. Use only Nellcor sensors.

SYMPTOM: Device Does Not Turn On

Possible Cause	Explanation and Corrective Action
Low battery	Check connections between device and transformer, and transformer and wall receptacle.
Device not powering up	Unplug unit from wall receptacle and check for breaks in cord. If connections are secure, check electrical outlet. Charging indicator is on if connections are good and the device is plugged into a working outlet. Notify biomedical department or Welch Allyn Technical Support.

SYMPTOM: Cuff Too Tight (Over Inflation)

Possible Cause	Explanation and Corrective Action
Pressure preset too high	Check default Pressure Preset setting in internal configuration mode. Unless patient has underlying systolic hypertension, set pressure preset at 160 mmHg. (If systolic blood pressure greater than pressure preset, the device automatically increases an additional 40 mmHg.)

SYMPTOM: Cuff Pops Off

Possible Cause	Explanation and Corrective Action
Inappropriate cuff size	Determine cuff size with the cuff markings or see "Chart for Determining Cuff Size" on page 31. If cuff continues to pop off, notify biomedical department or Welch Allyn Technical Support.
Cuff applied inside out	Re-apply cuff. Make sure Welch Allyn label is facing away from arm.

SYMPTOM: Cuff Deflating Too Slowly

Possible Cause	Explanation and Corrective Action
Normal operation	Typical time to take a reading is 20 to 45 seconds; 165 seconds is the maximum.
Pressure preset too high	Check default pressure preset setting in internal configuration mode.
Patient movement	Have patient sit still. Do not have arm tight against chest wall, as respiration may affect speed and accuracy of blood pressure measurement.
Small leak in pneumatic system	Check cuff tubing and pressure hose for leaks.

Maintenance

Welch Allyn will make available,upon request, circuit diagrams and other information which will assist appropriately qualified technical personnel in repair of this device. Please reference "4200-145E Service Manual" on page 55.

Cleaning

Spot Vital Signs

Occasionally wipe the Spot Vital Signs, as necessary, with a cloth slightly dampened with appropriately diluted, non-staining disinfectant solution. Use either 70% isopropyl alcohol, 10% chlorine bleach solution, or mild detergent in warm water. Never immerse the Spot Vital Signs in any type of fluid.

Do not use ethyl alcohol to clean the Spot Vital Signs device.

Note: Prevent water or other fluids from entering any connectors. Should this occur, dry the connectors with warm air. Check all measurement functions for proper operation.

Every 3 months, inspect the temperature probe, SpO_2 cord, and accessories for fraying or other damage. Replace as necessary.

Do not sterilize or autoclave the Spot Vital Signs.

Blood Pressure Cuff

Clean the durable one-piece blood pressure cuff with a damp cloth, or wash in water with soap or detergent. Before washing the cuff, remove the tube fitting(s), close off tubes with plugs (available as accessory 5082-163), and place the hook and loop fasteners in the closed position. After washing, allow the cuff to air dry. Re-assemble the tube fitting(s).

Disinfection: You may use glutaraldehyde-type liquid disinfectants on the durable cuff. Prolonged use of these disinfectants at full strength may cause discoloration of the white cuff markings.

Sterilization: Do not use steam or heat to sterilize the cuff or pressure hose. If necessary, use gas sterilization.

Do not press with a hot iron.

Cables and Pressure Hose

Wipe the cabling and pressure hose with a damp cloth moistened in a mild detergent solution. Do not immerse hose.

Temperature Probe

Periodically clean the temperature probe by wiping with an alcohol-dampened cloth, or wipe with warm water or properly diluted, non-staining disinfectant. Do not immerse the probe.

SpO_2 Sensor

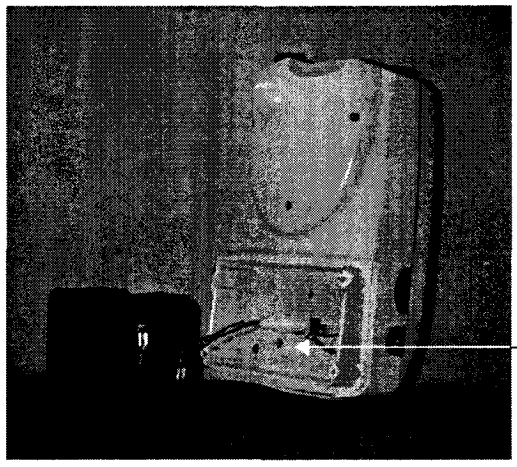
Clean the reusable SpO_2 sensor with isopropyl alcohol solution, and sterilize it using ethylene oxide (EtO), cold cycle. Do not immerse the sensor.

Battery Removal and Replacement

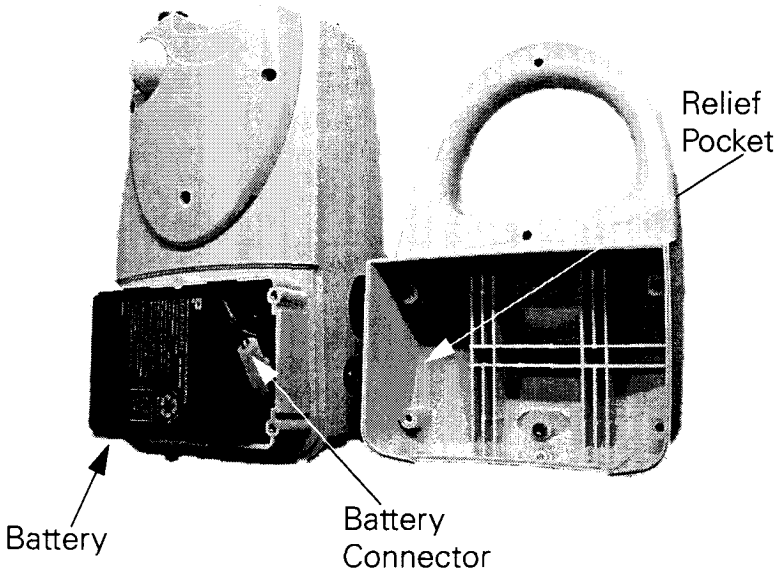
⚠ Only use the Welch Allyn 4200-84 lead acid battery. Using the incorrect battery will cause damage to the Spot Vital Signs and void the warranty.

If necessary, replace the internal battery after heavy use. When the battery no longer charges, remove it and replace it with a battery with the same part number. To replace the battery:

1. Ensure the AC power transformer cord is disconnected from the Spot Vital Signs and that the device is turned off.
2. Use a phillips-head screwdriver to remove the 4 screws holding the battery door. Remove the battery door and expose the battery.
3. Tip the Spot Vital Signs and slide the battery out. Disconnect the in-line connector and discard the old battery per local regulations. Re-connect new battery to unit connector as quickly as possibly to prevent loss of power to the unit and subsequent loss of clock time.
4. Attach the battery connector to the new battery as shown.
5. Slide the new battery into the battery compartment as far as it will go. Do not push the connector down into the case or lay it flat next to the battery. The relief pocket in the battery door purposely provides sufficient clearance for the battery connector.



6. Replace the battery door, tightening each of the 4 screws.
7. Connect the AC power transformer to the Spot Vital Signs and allow the new battery to charge for approximately 16 hours. It is possible to use the Spot Vital Signs during this charging period.
8. If an E38 error code is displayed when the device is powered on, refer to section "Setting the Date and Time" on page 27.



The battery is a lead-acid battery. In the USA, call 1-800-SAV-LEAD for instructions on how to recycle. For international users, contact your local authorities on recycling.

Supplies And Accessories

Latex-Free Blood Pressure Accessories and Supplies

Cuff and Bag Combination

5200-01	Adult (cuff, bladder, and connector)
5200-02	Large Adult (cuff, bladder, and connector)
5200-03	Child Print (cuff, bladder, and connector)
5200-10	Thigh (cuff, bladder, and connector)

Durable One-Piece Cuff

5082-203-3	Small Child (one-piece cuff and connector)
5082-204-3	Child (one-piece cuff and connector)
5082-205-3	Small Adult (one-piece cuff and connector)
5082-206-3	Adult (one-piece cuff and connector
5082-207-3	Large Adult (one-piece cuff and connector)
5082-208-3	Thigh (one-piece cuff and connector)

Disposable Monitor Style One-Piece Blood Pressure Cuff

5082-93-3	Small Child Cuff
5082-94-3	Child Cuff
5082-95-3	Small Adult Cuff
5082-96-3	Adult Cuff
5082-97-3	Large Adult Cuff
5082-98-3	Thigh Cuff

Miscellaneous

5082-59	Cuff: Adult
5082-61	Cuff: Large Adult
5082-63	Cuff: Child Print
5082-64	Cuff: Thigh
5200-04	Bladder: Adult (includes connector)
5200-05	Bladder: Large Adult (includes connector)
5200-06	Bladder: Child (includes connector)
5200-11	Bladder: Extra Large Adult (includes connector)
5200-12	Straight Pressure Hose (8ft./2.4M)
5200-19	Straight Pressure Hose (5ft./1.5M)
5200-08	Calibration T-Connector

Temperature Accessories and Supplies

02678-100	Oral Probe: (9ft./2.7M)
02679-100	Rectal Probe: (9ft./2.7M)
05031-101	Disposable Probe Covers (1,000 covers, packaged 25/box)
06137-000	Temperature Calibration Key

Nellcor Pulse Oximetry Accessories and Supplies

OxiMax Adhesive Sensors: Single-patient use

Description	Weight Range	Quantity	Catalog #
OxiMax Adult Sensor	>30 kg	Case of 24	MAX-AI
OxiMax Pediatric Sensor	10 - 50 kg	Case of 24	MAX-PI
OxiMax Infant Sensor	3-20 kg	Case of 24	MAX-II
OxiMax Adult Nasal Sensor	>50 kg	Case of 24	MAX-RI

OxiMax OxiCliq® Sensors: Reusable cable with adhesive sensor bandage

Description	Weight Range	Quantity	Catalog #
OxiCliq Sensor Cable (3 ft)		1	OC-3
Pediatric Oxygen Transducer	10 - 50 kg	Case of 24	OXICLIQ-P

OxiMax Reusable Sensors

Description	Weight Range	Quantity	Catalog #
Durasensor Adult Oxygen Transducer	>40 kg	1	DS-100A
Oxiband Adult/Neonatal* Transducer	<3 kg or >40 kg	1	OXI-A/N
Oxiband Pediatric/Infant Transducer	3 - 40 kg	1	OXI-P/I
Dura-Y Oxygen Transducer	>1 kg	1	D-YS
Ear Clip for Dura-Y Sensor	>30 kg	1	D-YSE
PediCheck Pediatric Spot-Check Sensor	3 - 40 kg	1	D-YSPD

OxiMax Sensor Cables

Description	Quantity	Catalog #
Extension cable, 4 ft.	1	DEC-4
Extension cable, 8 ft.	1	DEC-8

*** NOTE The Welch Allyn Spot Vital Signs is not intended for use on neonatal patients.**

Mounting Accessories and Supplies

4200-60	Complete Mobile Stand Unit includes: Storage Basket Pole and Base Assembly Transformer Mounting Kit
4200-62	Complete Wall Mount Unit includes: Storage Basket Wall Mount Bracket Transformer Mounting Kit
4200-70	Anti-Theft Kit for Spot Vital Signs

Miscellaneous Supplies

4200-84	Lead Acid Battery
4200-85E	Operator's Manual
421054-1E	Quick Reference/Error Code Card
4200-145E	Service Manual
4200-150E	Training Video
4200-100	Carrying Case
5200-101A	AC Power Transformer (desktop transformer, line cord not included) -120V, 60Hz
5200-103A	AC Power Transformer (desktop transformer, line cord not included) -240V, 50Hz
5200-103Z	AC Power Transformer (Australian version, desktop transformer with line cord included) - 240V, 50Hz
76400	Line Cord (United States/Canadian/Japanese version)
76402	Line Cord (European version)
76404	Line Cord (United Kingdom version)
76406	Line Cord (Australian version)

Warranty and Service

Warranty

Welch Allyn warrants the Spot Vital Signs, when new, to be free of defects in material and workmanship and to perform in accordance with manufacturer's specifications for a period of two years from the date of purchase from Welch Allyn or its authorized distributors or agents. Most accessories (temperature probe, SpO_2 sensor and cable, mobile stand, wall mount, and I.V. pole mount) carry a one-year warranty. The Durable One-Piece Cuff has a three-year warranty. Welch Allyn will either repair or replace any components found to be defective or at variance from manufacturer's specifications within this time at no cost to the customer. It shall be the purchaser's responsibility to return the Spot Vital Signs to Welch Allyn or an authorized distributor, agent, or service representative. This warranty does not include breakage or failure due to tampering, misuse, neglect, accidents, modification, or shipping. This warranty is also void if the instrument is not used in accordance with manufacturer's recommendations or if repaired by other than Welch Allyn or an authorized agent. Purchase date determines warranty requirements. No other express warranty is given.

IMPORTANT - Return the Instrument Registration Card

Remember to submit the instrument registration/warranty card for warranty validation. Complete the information and mail the pre-addressed card to Welch Allyn.

Service Policy

All repairs on products under warranty must be performed or approved by a Welch Allyn Service Center. *Unauthorized repairs will void the warranty*. Products out of warranty should be repaired by qualified electronics personnel or a Welch Allyn Service Center.

Technical Assistance

If you have an equipment problem that you cannot resolve, you may call the Welch Allyn Service Center nearest you for assistance. Technical service support is available by telephone on normal business days at the phone numbers listed on page 57.

If you are advised to return a product to Welch Allyn for repair or routine maintenance, schedule the repair with the service center nearest you.

Before returning a product for repair, you must obtain authorization from Welch Allyn. An RMA (Return Merchandise Authorization) number will be given to you by our service personnel. Be sure to note this number on the outside of your shipping box. Returns without an RMA number will not be accepted for delivery.

Welch Allyn Service Centers

For Service or Repair

USA	+ 1 315 685 4560 800 535 6663	Australia	+ 61 29 638 3000 800 074 793
Canada	800 561 8797	China	+ 86 216 327 9631
European Call Center	+ 353 46 906 7790	France	+ 33 15 569 5849
Germany	+ 49 747 792 7186	Japan	+ 81 33 219 0071
Latin America	+ 1 305 669 9003	Netherlands	+ 31 15 750 5000
Singapore	+ 65 6419 8100	South Africa	+ 27 11 777 7555
United Kingdom	+ 44 207 365 6780	Sweden	+ 46 85 853 6551

CE The CE Mark on this product indicates it has been tested to and conforms with the provisions noted with the 93/42/EEC Medical Device Directive.

European contact for regulatory compliance:

European Regulatory Manager
Welch Allyn Ltd.
Navan Business Park
Dublin Road
Navan, County Meath, Republic of Ireland
Tel: 353-46-67700
Fax: 353-46-27128

Service Manual/Spare Parts

A Service Manual is available to qualified electronic personnel by request. The Service Manual is a comprehensive guide to troubleshooting, service, and repair of the Spot Vital Signs.

Also included with the Service Manual is a complete spare parts list. Order spare parts from your local Welch Allyn Service Center.

Service Loaners

Service loaners are provided, on request, when repair service is provided by a Welch Allyn Service Center. Loaners for products repaired while under the original warranty, or while under extended warranty or service contract, are provided free of charge and are shipped within 48 hours of notification of need. Shipment charges are paid by Welch Allyn.

For service repairs outside of warranty or contract, loaners are available for a nominal daily charge and shipment is subject to availability. Loaners are shipped pre-paid; however, this charge is added to the service charges.